

Beach Profile Investigation

Objective

To study the effects of beach erosion and deposition by graphing and comparing two beach profiles.

Time required

Two class periods

Materials

per student

Glue

Colored pencil or marker

Construction paper: 8 1/2 in. x 11 in.

Scissors

Background

Note: Students should know how to plot data on a graph.

The shoreline is a dynamic environment, affected by many processes including waves, tides, wind, and human activities. It is important to understand the long-term trends of erosion and deposition on a beach, because the beach helps prevent damage to man-made structures. One method of analyzing a shoreline is to take profiles or cross sections of a beach over a period of time. Figure 1 shows a generalized beach profile. By comparing successive profiles, it can be determined whether waves are building up the beach, deposition, or taking material away, erosion.

Procedure

Fire Island is a barrier beach located south of Long Island, New York. It is typical of the barrier beach systems found along the eastern coast of the United States. A barrier island is a ridge of sand that is parallel to a shoreline and about three to 30 km (two to 19 mi.) offshore.

Two profiles of the beach were made at the same location over a period of six months. One was made during January (winter) and the other during June (summer). The data for each profile are found in Table 1.

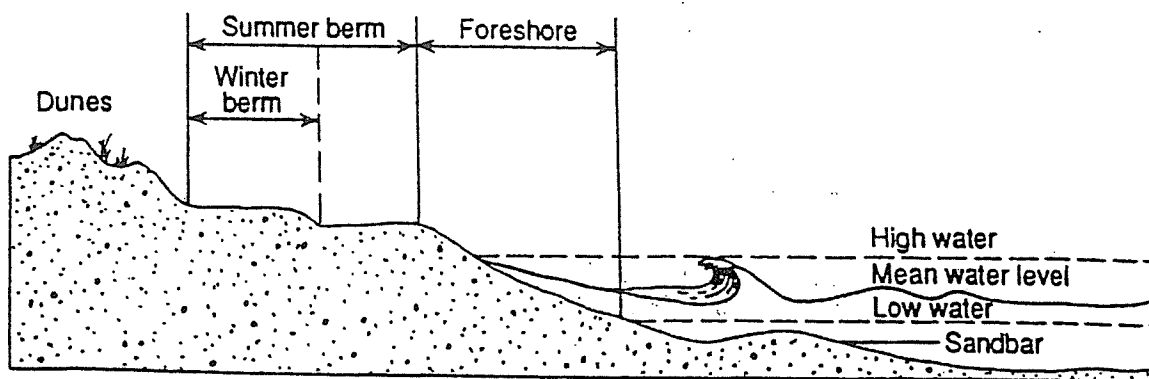


Figure 1. Generalized summer beach profile.

A beach profile shows several features that may change as a result of seasonal weather conditions. During the winter months, waves are generally high, and there are more storms, producing more frequent waves. Waves and tide action tend to erode the beach by carrying away material that may be deposited offshore, forming an underwater **sandbar**. Because of this erosion, the **berm**, the nearly horizontal section of a beach usually known as "the beach," is narrower in the winter months than in the summer months. The **foreshore**, the section between the low tide shoreline and the beginning of the berm, is less steep in winter than in summer. The foreshore is regularly covered and uncovered by the rise and fall of the tide.

During the summer months, waves are generally low and flat and tend to deposit sand and other particles on the beach. This deposition builds up the berm, making it wider, and steepens the foreshore. Sandbars may disappear.

1. Use a colored pencil or marker to mark sea level at a height of zero feet on the two graphs (Figure 2) on the worksheet.
2. Using Profile A data in Table 1, plot the height of the beach and the distance from the dunes on Profile A on the worksheet. Connect the points with a smooth line.
3. For Profile B data in Table 1, repeat step 2, on Profile B on the worksheet.
4. Cut along each profile line, and discard the portion above it.
5. Glue Profile A, the higher one, onto a sheet of construction paper. Position Profile B on top of Profile A so that the two profiles are aligned along the vertical and horizontal axes. Glue Profile B into place.
6. Label the following zones on each profile: dunes, berm, foreshore, and sandbar.

Table 1

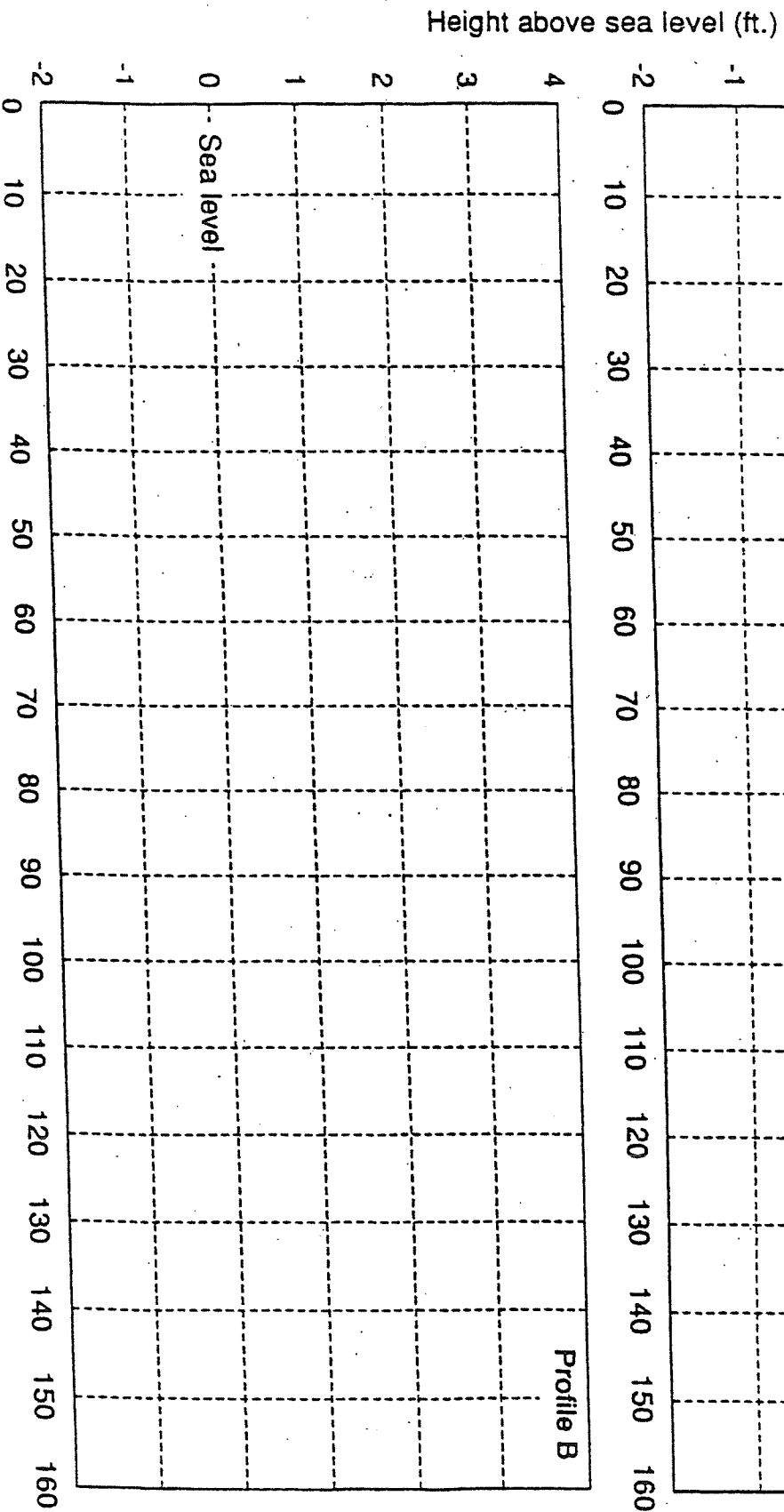
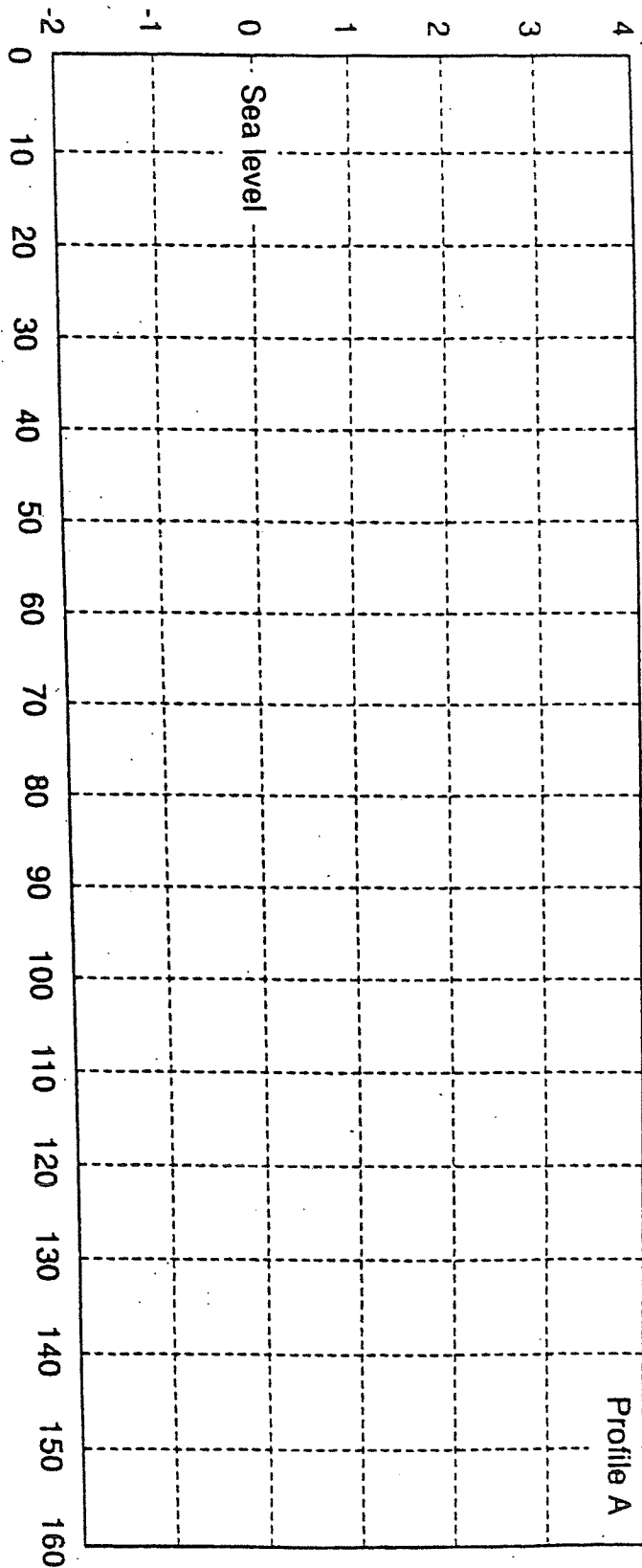
Beach profiles of Fire Island, New York.*

Profile A		Profile B	
Height above sea level (ft.)	Distance from dunes (ft.)	Height above sea level (ft.)	Distance from dunes (ft.)
3.4	0	3.2	0
3.2	6	3.0	8
3.0	12	2.8	16
2.8	24	2.6	26
2.8	30	2.4	36
2.8	36	2.0	44
3.0	54	1.6	50
2.8	64	1.0	60
2.4	72	0.6	68
1.8	78	0.2	78
1.4	86	-0.2	88
0.6	98	-0.6	98
0.0	108	-1.0	110
-0.4	118	-1.0	118
-0.4	122	-0.8	128
-0.2	130	-1.4	142
-0.6	136		
-0.8	138		
-1.2	146		
-1.4	156		

* English units are used rather than metric units because the data were collected in English units. Conversion to metric units would result in fractional data that are more difficult to use.

Questions

1. Which profile was made in January? How can you tell?
2. Which profile was made in June? How can you tell?
3. Why do beaches typically show seasonal variations?



Distance from dunes (ft.)

Beach Profile Investigation at Eiva Island, Maui, York